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ACTIVE VOLCANISM ON IO: RESULTS FROM GALILEO

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The Near-Infrared Mapping Spectrometer (NIMS) on the Galileo spacecraft observed Io during the spacecraft's three close encounters with this moon in October and November 1999, and February 2000. Among the many volcanic regions observed were Loki, Tvashtar, and Prometheus. These volcanic regions are different from each other, and provide examples of the variety of volcanic processes taking place on Io. Loki, the largest and most powerful volcano in the solar system, has a caldera floor covered by warm dark materials that are interpreted as cooling flows, surrounding a light-colored region that may be an island or raft. Loki's eruptions probably consist of floods of large lava flows that periodically cover the caldera floor. The vigorous phase of Loki's eruptions may be similar to the activity detected in November 1999 from Tvashtar Catena, interpreted as a high discharge rate eruption having a minimum temperature of 1200K. This is within the range of basaltic lavas, but does not exclude ultramafic-type eruption temperatures, such as those detected from Pillan Patera in 1997. The Prometheus volcano shows another style of eruption, as thermal emission is seen not from the caldera but from a long lava flow that feeds a persistent plume. The plume has migrated some 75 km since its detection by Voyager in 1979. NIMS observations show an SO₂ fallout ring from the Prometheus plume, confirming that this is an SO₂-rich plume, most likely driven by the interaction between hot magma and the local SO₂ snowfield. This differs from lava flows intruding on snowfields on Earth because of the long-lived plume activity, but its formation mechanism appears to have strong similarities to that of cones and craters formed over rootless conduits on Earth.